Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/19371
DOI URL: http://dx.doi.org/10.21474/IJAR01/19371

RESEARCH ARTICLE

"TREATMENT OF TRAUMATIC AMELOGENESIS IMPERFECTA THROUGH MICRO-ABRASION TECHNIQUE: A CASE REPORT"

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Manuscript Info

Manuscript History
Received: 25 June 2024
Final Accepted: 27 July 2024
Published: August 2024

Key words:-
Amelogenesis Imperfecta, Brown Lesions, Microabrasion

Abstract

In recent decades, several ultra-conservative techniques have been employed for the treatment of amelogenesis imperfecta, primarily based on non-invasive procedures. In this article, we will shed light on the technique of microabrasion, its indications, advantages, and limitations. Subsequently, we will illustrate the steps of the technique with a clinical case. Finally, we will discuss the short-term and long-term outcomes. The microabrasion technique has proven effective as a non-invasive alternative among the array of proposed treatments for white and brown enamel lesions.

Introduction:-

Traumatic hypomineralization occurring on a permanent tooth result from a sequel of trauma that affected the primary teeth. Indeed, during an impact on a primary tooth, the underlying germ can be affected regardless of the severity of the trauma. This can occur with concussion, subluxation, lateral displacement luxation, intrusion, extrusion, or even avulsion [1]. This acquired phenomenon often occurs between birth and the age of 5, a risk period due to learning to walk and exploring the environment.Traumatic hypomineralization is characterized by a white spot that becomes visible when the underlying permanent tooth erupts. This corresponds to hypomineralization of the enamel, giving it a distinctive appearance. The lesions are often confined to a single tooth, varying in color from white to brown, and typically located in the incisal third. They are often pinpoint in nature, with significant variability in hue, contours, and shape. The condition is always asymmetrical compared to homologous and contralateral teeth, with well-defined borders. Their appearance ranges from opaque to more or less hypoplastic depending on the severity of the damage [2].In recent decades, several ultra-conservative techniques have been employed for treating discolorations, including external bleaching, microabrasion, erosion-infiltration, and mega-abrasion [3].Enamel microabrasion is a conservative technique that combines the chemical action of an acid agent with the mechanical action of an abrasive agent applied to the tooth with a low-speed rotary instrument. Hydrochloric acid or phosphoric acid is used for the chemical action, while the mechanical action is provided by pumice, alumina, or silicon carbide particles [4].Due to its abrasive nature, this technique results in surface roughness. To reduce these irregularities and increase enamel hardness, it is important and necessary to finish the treatment with a careful polishing. To achieve this, it is recommended to use a polishing paste with two different granulometries (2-4 µm according to Scheibe et al. (2009)) so that the enamel regains its natural appearance and shine [5].

Case Report:

The patient is a 22-year-old woman in good general health with a history of trauma to her primary incisors at age 5, resulting in impaction of the 51.The clinical examination revealed a brown spot localized on the middle third of the upper right central incisor (**Figure 1**); no other spots were present on the other teeth. The clinical diagnosis was amelogenesis imperfecta resulting from the trauma.The treatment plan initially involved motivating the patient to m Microabrasion treatment was th the following protocol:

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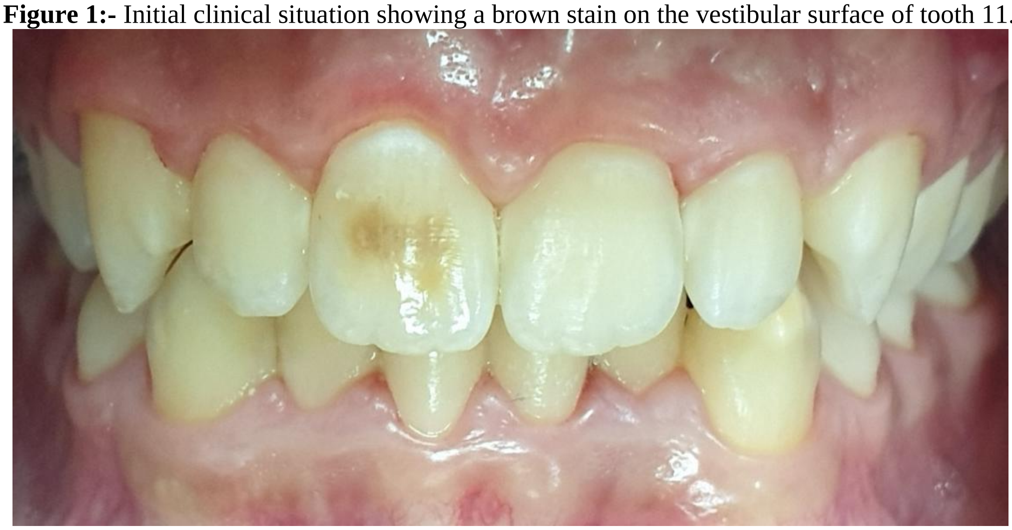
- Placement of a rubber dam to protect the gingiva from the erosive and abrasive effects of the microabrasion paste.
- Application of ligatures around each tooth to ensure proper sealing and to expose the tooth surface to be treated.

The microabrasion paste was applied with a syringe to the vestibular surface of the tooth (**Figure 2A**). A specialized brush used for cleaning and polishing teeth, is mounted on a contra-angle handpiece and rotating at low speed (approximately 500 rpm), was held against the tooth surface with moderate pressure to allow abrasive action (**Figure 2B**). According to protocols proposed in the literature, a 10-second rotation cycle is required. Generally, about ten cycles are performed per session [6,7,8].However, the duration of the protocol depends on the nature and type of the lesion as well as the quality of the enamel. Each cycle removes an enamel thickness of 10 to 20 microns. After each cycle, excess paste is suctioned, and the tooth surfaces are rinsed thoroughly with water.After polishing (**Figure 2C**), the final result is shown in the (**Figure 3**).

Figure 1:- Initial clinical situation showing a brown stain on the vestibular surface of tooth 11.



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Figuree 2A:- Application of the microabrasion past with a syringe to the vestibular surface of the tooth.

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Figure 2B:- Abrasion performed using a brush mounted on a contra-angle handpiece.

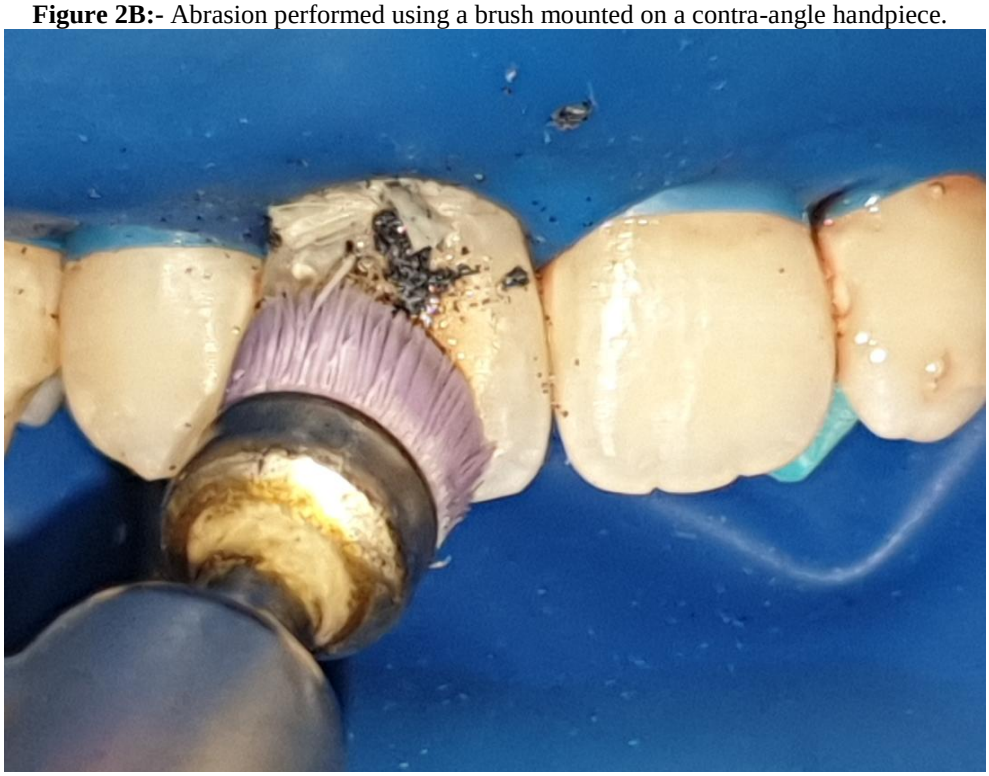

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Figure 2C:- Abundant rinsing was performed, and the tooth was evaluated, with the brown stain removed.

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Figure 3:- The final results show the glossy appearance and smoothness of the surfacemaintained on the tooth 11.

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Discussion:-

To treat dental discolorations, several therapies have been proposed: microabrasion, macroabrasion, external bleaching, and prosthetic restorations (veneers, crowns, etc.). Considering that most patients are young and prosthetic treatment options involve excessive removal of tooth structure at an early age, in addition to high costs and lengthy sessions [9],Microabrasion is a chemomechanical treatment that involves applying an acid and an abrasive agent to the surface of the affected tooth, aimed at improving or even eliminating discolorations limited to the superficial layer of enamel. The thickness removed varies, according to studies, from 20 to 200 μm depending on

the acid concentration and the duration of the application. It is also noted that brown stains are generally more superficial than white stains. The latter respond to enamel microabrasion in approximately 75% of cases on average, compared to a success rate approaching 100% for brown stains [10]. During the microabrasion procedure, the acidic erosion and abrasive action of the particles have an effect on the enamel called the "abraded effect," giving the enamel particular histological and optical characteristics [9].Histologically, the erosive action of the acid leads to the disorganization of the prismatic structure of the enamel. During its reorganization, a mineral matrix is produced on the periphery, allowing the formation of a surface enamel layer consisting of highly compressed aprismatic enamel reinforced with particles from the microabrasion material (such as silica) and/or polishing pastes (such as fluorides), which gradually remineralizes in contact with saliva [10, 11]. Optically, the "abraded effect" results in a smoother enamel surface without irregularities, giving it a so-called "glassy" or "varnished" appearance. Indeed, the enamel surface, formed of aprismatic enamel on the periphery, allows for the reflection and refraction of incident light, thereby enhancing the aesthetic appearance of the enamel, even more so after hydration of the tooth by saliva. This is explained by the fact that hypomineralized enamel is characterized by the presence of multiple interfaces separating two media with different refractive indices (RI), namely RI=1.62 for hydroxyapatite and RI=1.33 for water. When the difference in refractive index is accentuated, so is the dispersion. This is the case when drying dental surfaces, replacing water in a lesion with air, which has an even lower refractive index (RI close to 1), making initially non-visible hypomineralization appear [9, 11].Several materials are used for microabrasion treatment. Prema®, Premier Dental Company (Philadelphia, PA, United States), containing 10% hydrochloric acid and abrasive silicon carbide particles with a granulometry of 30 to 60 μm, and Opalustre® (Ultradent, South Jordan, Utah, USA), containing 6.6% hydrochloric acid and microparticles of silicon carbide with a granulometry of 20 to 160 μm, are the most widely available and commonly used products [11].The microabrasion treatment is performed using special rubber cups mounted on a contra-angle handpiece at a low speed of 300 rpm, applying 10 seconds per tooth with a standardized force of 100 grams, equivalent to 2 bars [12].Originally described by Croll et al. (1989) [10], microabrasion is reserved for discolorations limited to the external layer of enamel tissue, without involvement of the dentin. Thus, enamel microabrasion may be indicated [8, 13]: to treat mild to moderate fluorosis; to correct irregularities in the enamel surface that may be secondary to orthodontic treatment, after removal of residual bonding materials; to treat various enamel discolorations, whether white or opaque, even with porosities, resulting from the demineralization/remineralization process. This is common in initial enamel lesions found around orthodontic brackets. However, these stains should first be treated with remineralizing agents.The most important factors contributing to the success of enamel microabrasion are the location and depth of the enamel discolorations [14]. However, determining the depth of discolorations is not straightforward as current available methods are very limited and provide little information on this matter. An LED light source placed at the palatine or lingual surface of the tooth can help the clinician examine the enamel. This can be used to estimate the depth of the lesion, as a darker color indicates a deeper coloration [11].Microabrasion involves removing the stain rather than merely covering it or altering the enamel. The procedure takes less time and is easy to perform. It also eliminates the need for tooth preparation [15]. Rubber dam isolation is mandatory during the procedure as it not only protects the soft tissues but also provides comfort and reduces contact with saliva [16]. Three applications of Opalustre in a single session were needed to remove the brown pigmentation. After using the microabrasion technique, the discoloration improved and a shiny surface was achieved because, during the procedure, the demineralized layer was almost completely removed. A slight superficial abrasion of the demineralized enamel, combined with simultaneous acidic erosion, leads to the formation of a compacted mineralized tissue within the organic areas, replacing the external prismatic enamel layer with a densely compacted aprismatic region. When light is reflected off this surface and refracted through it, it does so differently than on an untreated surface, and these optical properties of the newly micro-abrasioned surface camouflage the remaining deep stains.

Conclusion:-

The microabrasion technique can be considered an interesting alternative to more invasive prosthetic techniques based on composite reconstructions or ceramic veneers. This new minimally invasive approach provides good aesthetic results and may reduce costs for patients without causing significant loss of enamel structure and without requiring cavity preparations.

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